CIAT in Asia

- Eco-efficient solutions to boost smallholder yields and income
- Research for long-term development: Building on strong foundations
- Partner and private sector engagement for sustainable growth
- Driving a balance: Economic growth and ecological sustainability
- Climate-smart farm and soil management solutions

CIAT
International Center for Tropical Agriculture
*Since 1967 / **Science to cultivate change***

CGIAR

Towards empowerment in the tropics

The concept of eco-efficiency is the foundation for CIAT's vision of what agriculture must offer in the future. This approach promotes competitive and profitable food production and economic empowerment for the world's poorest people, while preserving ecological resources, with a focus on our four mandate crops: cassava, tropical forages, beans, and rice. Our new strategy 2014–2020, outlines the importance of cassava and forages for livestock in achieving eco-efficiency goals in the region. It reflects our belief that through a combination of international expertise and strong collaboration with national partners, the shared vision of an eco-efficient and sustainable future is not only achievable, it is vital to ensure global food security.

CIAT in Asia: Balancing eco-efficiency with rapid change

- Increasing the competitiveness and efficiency of local farming systems while maintaining eco-efficiency
- Engaging smallholders more effectively with markets to boost incomes
- Working with partners to boost yields by at least another 30% through continued genetic improvement, better agronomy, and pest and disease management

Over the last three decades, the Center's initial focus on cassava and forages germplasm improvement in Asia has broadened to achieve impact in livestock management, land-use, natural resource and soil management, linking farmers with markets to improve value chain efficiency, and bolstering resilience to the impacts of climate change. With a regional office in Hanoi, CIAT also has offices and representatives in Vientiane, the Lao People's Democratic Republic, Phnom Penh in Cambodia, and at the Chinese Academy of Tropical Agricultural Sciences in Haikou, the People's Republic of China.

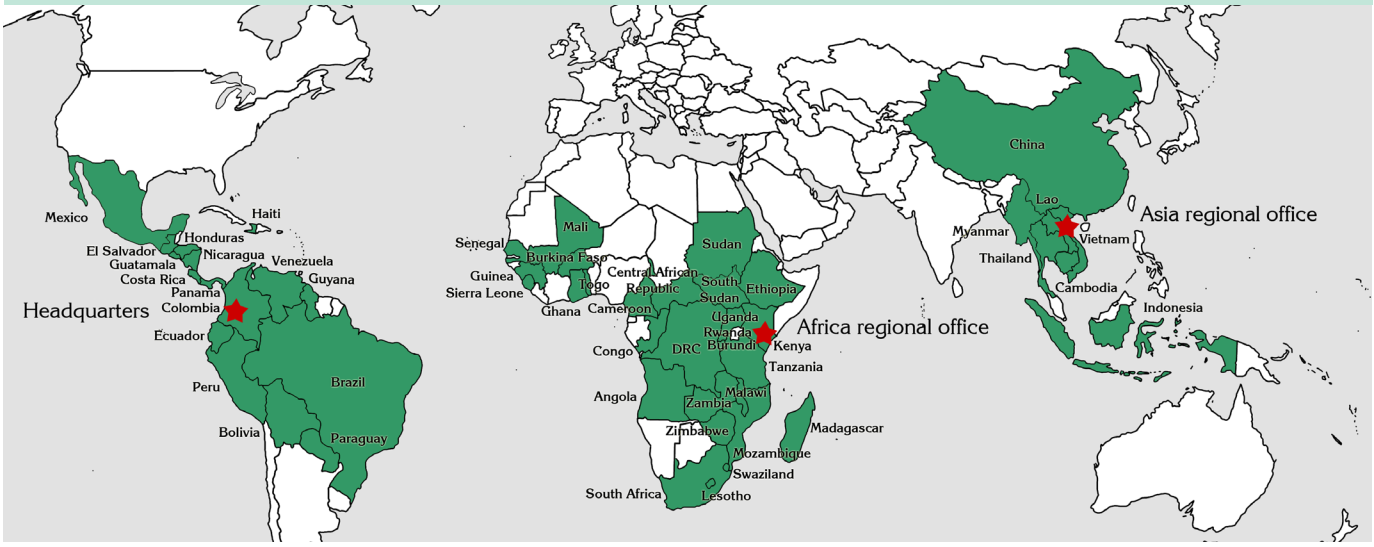
Plant breeding and agronomy: Expanding in the region

High-yielding cassava varieties released by national partners, using improved germplasm from CIAT, are the hallmark of our success in the region, contributing significant impact on food security in the uplands and mountainous areas, where rice deficits are common for several months a year. In addition to boosting yields in these areas where cassava is directly consumed, the Center is also committed to improving cassava varieties for industrial use, for example by boosting starch content, so smallholder farmers can cash in on the currently buoyant cassava starch market. CIAT's plant breeding and agronomic expertise, together with the expansion of state-of-the-art facilities, support regional research teams with timely, site-specific recommendations on intercropping, crop management, soil fertility management, and breeding techniques.

The cassava boom

Throughout Southeast Asia, cassava has been transformed from a humble root crop from the Americas into a prized industrial input. Rapidly rising demand from the food, livestock feed, starch, biofuel, and other industrial markets has led many

CIAT's Global Vision





smallholder farmers, including from remote ethnic minority communities, to grow cassava as a cash crop. Bolstered demand is driving a dynamic agricultural sector and delivering better incomes. In Vietnam alone, 3.1 million tons of cassava fetched US$1.1 billion in exports in 2013, with the bulk supplied by smallholder farmers, and demand for the crop is expected to increase. CIAT's collaborative breeding activities with partners in Asia such as the Thai Department of Agriculture and Kasetsart University in Thailand have resulted in the release of dozens of improved cassava varieties dating back to 1983. CIAT-related varieties are now grown on more than 50% of the cassava area across the region, and have contributed to marked increases in yield, improving the livelihoods of millions of cassava farmers.

Clamping down on pests and diseases

As cassava is a relative newcomer to Asia, introduced from South America by traders in the 19th Century, Asia has remained a relatively pest-free region. But this is a trend in rapid reverse as pests and diseases catch up, spreading from South America and Africa. The pink mealybug *Phenacoccus manihoti*, or the devastating cassava witches'-broom disease, which can cost farmers their entire crop harvest, pose a significant threat to smallholder livelihoods and incomes. In response, researchers have ramped up efforts to contain and clamp down on pests and diseases threatening devastating impact on cassava across the region. South-South collaboration between regional research teams in South America and Asia supported by CIAT has been vital to ground-breaking progress made towards monitoring, evaluating, and controlling this threat. Regional research teams continue to find and scale up solutions, for example sourcing and multiplying cassava stakes free of disease for local farmers to cultivate.

A roots-to-riches story

Launched by CIAT and the International Potato Center (CIP) together with national research partners and supported by the International Fund for Agricultural Development, the Program for Linking Livelihoods of Poor Smallholder Farmers to Emerging Environmentally Progressive Agro-Industrial Markets has enabled upland smallholders and ethnic minorities to take advantage of this trade. The program successfully raised cassava yields by 50 percent, boosting starch concentration. Improved sloping-land management and fertilizer use boosted production systems, and a closed production system was developed through which farmers can buy back cassava residues as high-quality livestock feed, cheaper than commercial feeds, making smallholder producers more competitive.

Emerging pests and diseases in Asia

Taking the view that prevention is better than cure, CIAT scientists and research partners have ramped up efforts to clamp down on emerging pests and diseases in Southeast Asia, with support from the International Fund for Agricultural Development (IFAD) and the Colombian Presidential Agency for International Cooperation. The spread of new cassava pests and diseases is fuelled by unchecked movement of cassava planting stakes between countries. In the absence of effective controls, the pests and diseases are coming dangerously close to engulfing cassava harvests, biting into smallholder incomes from this increasingly important crop. Workshops and international training activities have focused on strengthening regional capacity to identify and prevent serious cassava threats like cassava witches'-broom disease and cassava mealybug *(Phenacoccus manihoti*), known locally as the pink mealybug, from spreading. This capacity will be further rolled out – particularly among farmers – in 2014. Extensive monitoring and evaluation of these threats is ongoing, together with research to identify and multiply disease-free cassava stakes and efforts to raise awareness among farmers about new threats to cassava production.

The impact of tropical forages

Livestock have always been important for smallholders in Asia, particularly in the uplands where they are considered savings accounts, sold to free up cash to pay school fees for example. Given the soaring demand for livestock products, there is huge potential for smallholder farmers to tap into growing and lucrative markets. Yet despite the money-making potential of livestock, traditional cattle keeping practices in many parts of Asia are low on income. As grazing and browsing land becomes scarce, feed has to be collected from further away, and herding cattle can become a full-time job. On top of that, low quality wild fodder means animals do not get the nutrition they need to gain weight – all too often losing farmers the opportunity to maximize on income and save labor time. With the aim of helping farmers shift from being livestock keepers to producers, CIAT researchers in collaboration with local partners have spent the past two decades investigating 6,400 forage materials from CIAT's headquarters in Colombia for suitability in local conditions.

Better beef, boosted incomes

In Cambodia, cattle are rarely raised by smallholder farmers for their market value alone. Almost all of the 3.2 million cattle in the country provide essential draught power for land preparation or transport and manure for maintaining soil fertility. Crucially, they are valued as a "cash account" that can be liquidated easily when needed. Yet with annual increases in beef consumption for the whole of Southeast Asia projected at a sustained 3.4% until 2020, rising demand for meat linked to more affluent populations presents a niche opportunity for smallholder farmers to cash in on their cows. But keeping cattle is a time consuming and risky business. It is perceived as a backup system rather than a major income generator. Challenging this perception, CIAT researchers and partners, with support from the Australian Government, developed an improved forage management system that drastically cuts time spent on gathering forages, while boosting cattle growth through better feed, transforming them into a high value commodity. Fast-growing, high-quality, largely disease and pest-resistant forages ensured that steers can double in value from US$200 to $400 over a mere 120-day period. With these forages grown near the house, the time spent gathering feed is cut by an average of two hours daily, and given that children usually collect forages, more children are getting to school on time, with teachers reporting better progress in school. Enterprising farmers have embraced the opportunities by selling forages and cuttings, resulting in extra income of around $300 a year. These systems also provide security for people living in flood-prone lowland areas, allowing them to source feed from upland areas during floods. The original project target of reaching 500 households has been exceeded in one province alone – with forages now grown in every province in Cambodia.



Soil fertility: Debunking the myths

Getting our soils facts straight is key to increasing cassava production in Southeast Asia. Cassava's low demand for – and highly efficient use of – water and most nutrients has earned it a reputation as an ideal crop to cultivate on poor soil. But the association between degraded soil and the crop itself seems to have stuck, and the stigma is difficult to shake off. The fact is that proper erosion control and soil fertility management is at the heart of sustainable cassava production, and has the potential to boost smallholder livelihoods. Concerns that cassava exacerbates soil erosion arise because growing it on steep slopes without intercropping or contour planting will cause erosion. Cassava has large roots, and needs to be planted at wide spacing for higher yields. During the two- to three-month period before the leaves grow enough to close the canopy, soil between plants is left exposed to direct rainfall, which in turn results in soil runoff and loss. But intercropping cassava with fast ground-covering, short-term crops like peanut can protect the soil surface, providing a quick harvest and income, and helping to control weeds. High-value forage species can be cultivated on contour strips to support livestock keeping and strengthen soil conservation, ensuring cassava production in marginal environments is not only sustainable, it can support other income-generating activities too.

Making the link: Getting to market

CIAT is expanding and strengthening its opportunities to work with partner agencies on market research linked with cassava and forage-livestock systems within broader, holistic farm systems. During the past decade, Asia's team has built on much experience working across cassava and livestock value chains to ensure farmers get the best price for their product. Instead of working directly with farmers, the Center's focus has been building and strengthening institutional links. Linking farmers with buyers has enabled them to weigh up the economic benefits of different products and realize where they can add value based on market opportunities. Smallholder farmers are realizing that producing quality goods is one skill; adding value and selling them successfully is another.

A rich investment

Ongoing research by CIAT and partners over the last two decades, supported by the Nippon Foundation, has promoted increased cassava yields and sustainable soil management throughout the region. Participatory training in Thailand, Vietnam, and China taught farmers techniques to help restore tired, degraded soils, reduce soil erosion and harmful greenhouse gasses, and boost soil fertility.

The project created new opportunities for the rural poor to raise their incomes and respond to increased demand for cassava products. For example, in Vietnam 15,000–20,000 households adopted various new technologies. The economic benefit of increased cassava yield and additional pig production as a result of these new technologies was valued at US$2.2 million per year.

Going gourmet in Vietnam's uplands

Hoa Bui is an ethnic minority farmer in Vietnam's upland northwestern district of Tan Lac in Hoa Binh Province. Her stilted farm, nestled in remote green sloping fields, is one of many which has benefited from growing chayote in the past five years. In 2010, Hoa's farm produced 1.6 tons of chayote leaves and shoots, fetching a net income of US$350. Had she harvested maize instead, her net income would have totaled no more than US$40. The Small-scale Agro-enterprise Development in the Uplands (SADU), which provided training in improved planting techniques for chayote, has built relationships between farmers and traders and resulted in much bigger investments in chayote-growing communes, with traders providing pick-ups by motorbike or truck, advising which fertilizers to apply and how to bundle chayote.

Climate change: Looking ahead

With strong technical expertise drawn from around the world, CIAT leads the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). The global team plays a dynamic role in the development of adaptation strategies to be mainstreamed into national policy and development targets. In the region, researchers work on a diverse range of climate considerations. These include analyzing climate impacts, developing adaptation and mitigation strategies, evaluating policies and benefit-sharing trade-offs for eco-system services and linking farmers with sustainable commercial relationships and inclusive supply chain policies.

Crop suitability studies

Using the latest modeling technology, researchers can create a bigger picture surrounding land-use change in the Greater Mekong Sub-region for example due to mining, infrastructure, or agricultural practices. Past land-use change combined with predicted crop-climate suitability can help us better understand how a changing climate may impact diverse agricultural systems. Using the latest available data, CIAT and local partners devise crop suitability studies which allow our researchers to stay ahead of climate trends expected to impact agriculture across the region.

Promise to partners

Consolidated links with national research partners have led to strong relationships to scale up solutions and promote South-South cooperation. CIAT is positioned to stay ahead of new threats to global food security with a proven track record of high integrity, transparency, environmental responsibility, and impact. A growing team in Asia is set to strengthen regional collaboration, pursuing appropriate solutions for local conditions. We are committed to our growing partnerships with regional research partners, governments, private sector, and CGIAR – a global research partnership for a food secure future.

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